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EXAMINER

HO, ALLEN C

ART UNIT

PAPER NUMBER

2882

DATE MAILED: 09/15/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/063,850

Applicant(s)

HIGGINS ET AL. *he*

Examiner

Allen C. Ho

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 17 May 2002.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-4, 14 and 15 is/are allowed.
- 6) ☒ Claim(s) 5, 6, 8-10, 13, 16, 17, 19-21 and 24 is/are rejected.
- 7) ☒ Claim(s) 7, 11, 12, 18, 22 and 23 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 03 September 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 0602.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Drawings

1. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: 46 in Fig. 2, 64 in Fig. 4, 67 and 70 in Fig. 5, 156 and 158 in Fig. 6. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

2. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(4) because reference character "64" has been used to designate both the window in Fig. 3 and the end of bearing retainer 78 in Fig. 4. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

3. The disclosure is objected to because of the following informalities:

- (1) Page 6, paragraph [0028], line 6, --stud-- should be inserted after "target".
- (2) Page 8, paragraph [0034], line 8, "7" should be replaced by --102--.

Appropriate correction is required.

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4. The use of the trademark INCOLOY 909 and CTX REX 20 has been noted in this application. It should be capitalized wherever it appears and be accompanied by the generic terminology.

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

5. The abstract of the disclosure is objected to because it exceeds 150 words. Correction is required. See MPEP § 608.01(b).

Claim Objections

6. Claim 7 is objected to because of the following informalities: line 1, "the" before "thin-walled tubular stem" should be replaced by --a--. Appropriate correction is required.

7. Claim 11 is objected to because of the following informalities: line 5, "the" before "thin-walled" should be replaced by --a--. Appropriate correction is required.

8. Claim 14 is objected to because of the following informalities:

(1) Line 4, "the" before "cathode" should be replaced by --a--.

(2) Line 14, "the" before "thin-walled" should be replaced by --a--.

Appropriate correction is required.

9. Claim 18 is objected to because of the following informalities: claim 18 should depend on claim 17. Appropriate correction is required.

10. Claim 19 is objected to because of the following informalities: line 3, "shaft" should be replaced by --axial projection--. Appropriate correction is required.

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11. Claim 21 is objected to because of the following informalities: line 16, "target/stem" should be replaced by --target/bearing--. Appropriate correction is required.

12. Claim 22 is objected to because of the following informalities:

(1) Line 4, "the" before "thin-walled" should be replaced by --a--.

(2) Line 5, "thermal barrier" should be replaced by --stem--.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

13. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

14. Claims 9, 13, 20, and 24 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 9, 13, 20, and 24 contain the trademark/trade name INCOLOY 909. Where a trademark or trade name is used in a claim as a limitation to identify or describe a particular material or product, the claim does not comply with the requirements of 35 U.S.C. 112, second paragraph. See *Ex parte Simpson*, 218 USPQ 1020 (Bd. App. 1982). The claim scope is uncertain since the trademark or trade name cannot be used properly to identify any particular material or product. A trademark or trade name is used to identify a source of goods, and not the goods themselves. Thus, a trademark or trade name does not identify or describe the goods associated with the trademark or trade name. In the present case, the trademark/trade name is

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used to identify/describe the material used to make the rotor hub and, accordingly, the identification/description is indefinite.

Claim Rejections - 35 USC § 102

15. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

16. Claim 5 and 6 are rejected under 35 U.S.C. 102(b) as being anticipated by Ganin *et al.* (U. S. Patent No. 5,838,762).

With regard to claim 5, Ganin *et al.* disclosed an anode assembly for an x-ray tube comprising: a rotor body assembly including a rotor (18) and a stator (column 2, lines 57-59), the stator being operatively positioned relative to the rotor body assembly; a target (16), operatively positioned relative to the cathode assembly (inherent), operatively connected to a bearing assembly (20) by a thermal barrier (28); and means, including a rotor hub (32) operatively positioned within the rotor, coaxially aligned with a shaft (20) from the bearing assembly, for operatively connecting the shaft of the bearing to the rotor hub of the rotor body assembly.

With regard to claim 6, Ganin *et al.* disclosed the anode assembly of claim 5, wherein the means (interference fit) includes fastening without using mechanical fasteners or metallurgical bonding.

17. Claims 5 is rejected under 35 U.S.C. 102(b) as being anticipated by Eggelsmann (U. S. Patent No. 4,115,718).

With regard to claim 5, Eggelsmann disclosed an anode assembly for an x-ray tube comprising: a rotor body assembly including a rotor (8) and a stator (column 3, lines 56-59), the stator being operatively positioned relative to the rotor body assembly; a target (3), operatively positioned relative to the cathode assembly (2), operatively connected to a bearing assembly (9, 10, 11, 12) by a thermal barrier (4); and means, including a rotor hub (9) operatively positioned within the rotor, coaxially aligned with a shaft (10) extending from the bearing assembly, for operatively connecting the shaft of the bearing to the rotor hub of the rotor assembly.

Claim Rejections - 35 USC § 103

18. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

19. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Ganin *et al.* (U. S. Patent No. 5,838,762) as applied to claim 5 above, and further in view of Caraher *et al.* (U. S. Patent No. 4,866,748).

With regard to claim 8, Ganin *et al.* disclosed the anode assembly of claim 5.

However, Ganin *et al.* failed to teach that the rotor hub material is selected to match coefficients of thermal expansion between the rotor and the bearing shaft.

Caraher *et al.* taught matching the coefficients of thermal expansion between the rotor (54) and the shaft (56) (column 8, lines 18-23).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to match coefficients of thermal expansion between the rotor and the bearing shaft when they are joined by interference fit, since a person would be motivated to minimize mechanical stress between the rotor and the bearing shaft when operating at high temperature, which would lead to early failure of the x-ray tube.

20. Claims 6 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eggelsmann (U. S. Patent No. 4,115,718) as applied to claim 5 above, and further in view of Ganin *et al.* (U. S. Patent No. 5,838,762) and Caraher *et al.* (U. S. Patent No. 4,866,748).

With regard to claims 6 and 8, Eggelsmann disclosed the anode assembly of claim 5.

However, Eggelsmann failed to teach that the means includes fastening without using mechanical fasteners or metallurgical bonding. Furthermore, Eggelsmann failed to teach that the rotor hub material is selected to match coefficients of thermal expansion between the rotor and the bearing shaft.

Ganin *et al.* disclosed an interference fit for connecting a bearing assembly (20) to a rotor body assembly (18). Ganin *et al.* taught that interference fit is particularly advantageous for eliminating unbalance in the main joints of the anode assembly.

Caraher *et al.* taught matching the coefficients of thermal expansion between the rotor (54) and the shaft (56) (column 8, lines 18-23).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to connect the shaft of bearing to the rotor hub of the rotor body assembly using interference fit, since a person would be motivated to extend the service life of an x-ray tube by using an anode assembly that will maintain its balance at a high rotational speed.

Furthermore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to match coefficients of thermal expansion between the rotor and the bearing shaft when they are joined by interference fit, since a person would be motivated to minimize mechanical stress between the rotor and the bearing shaft when operating at high temperature, which would lead to early failure of the x-ray tube.

21. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Eggelsmann (U. S. Patent No. 4,115,718) in view of Leguen *et al.* (U. S. Patent No. 4,734,927) and Ganin *et al.* (U. S. Patent No. 5,838,762).

With regard to claim 10, Eggelsmann disclosed an x-ray system comprising: an enclosure (inherent); an x-ray tube, operatively positioned inside the enclosure, for directing x-rays toward a target, the x-ray tube comprising: an envelope (1); a cathode (2) operatively positioned in the envelope; an anode assembly including: a rotor body assembly including a rotor (8) and a stator (column 3, lines 56-59) being operatively positioned relative to the rotor body assembly; a target (3), operatively positioned relative to the cathode assembly, operatively connected to a bearing shaft (10) by means of a thin-walled tubular thermal barrier (4); and a target/bearing assembly to the rotor body assembly connection structure (4, 7, 9), operatively positioned for operatively connecting the target/bearing assembly to the rotor body assembly.

However, Eggelsmann failed to teach that the x-ray system comprises at least one cooling means, operatively connected to the enclosure for cooling the system. Furthermore, Eggelsmann failed to teach that the target/bearing assembly to the rotor body assembly connection structure further comprises shrink fit means, for operatively connecting the target/bearing assembly to the rotor body assembly.

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Leguen *et al.* disclosed an x-ray system comprising a cooling means (3) operatively connected to the enclosure (1) for cooling the system.

Ganin *et al.* disclosed a shrink fit means (interference fit) for connecting a bearing assembly (20) to a rotor body assembly (18). Ganin *et al.* taught that shrink fit is particularly advantageous for eliminating unbalance in the main joints of the anode assembly.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to provide a cooling means connected to the enclosure for cooling the system, since a person would be motivated to remove heat generated by the x-ray tube in order to extend its service life.

Furthermore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to connect the target/bearing assembly to the rotor body assembly using shrink fit means, since a person would be motivated to extend the service life of an x-ray tube by using an anode assembly that will maintain its balance at a high rotational speed.

22. Claims 16, 17, 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eggelsmann (U. S. Patent No. 4,115,718) in view of Ganin *et al.* (U. S. Patent No. 5,838,762).

With regard to claim 16, Eggelsmann disclosed a rotating anode assembly for an x-ray tube, such rotating anode assembly being one of the type which includes an anode target (3) and a cylindrical rotor means (8), such rotor means having an axis (rotational axis), means responsive to circumferentially applied electromagnetic force (stator) causing the rotor means to rotate about such axis, and bearing means (11, 12), comprising: a shaft (10) axially extending from one end of the bearing means and terminating forward in an axial projection configuration, the shaft being rotationally associated with the rotor means and rotatable therewith, the target having a

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generally disc-shaped body and being coaxial with the axis, the target having a radially tapered surface portions on one face thereof adjacent the circumferential periphery of the target, the surface portions being adapted to convert incident electron energy striking the same in an axially parallel direction into x-ray energy emitted therefrom at a predetermined angle relative to the incident electron energy (inherent), and further having an axial projection (4) extending from the opposed face thereof, the axial projection being connected with a coaxially located rotor hub (9) disposed within the rotor means.

However, Eggelsmann failed to teach that the axial projection being shrink fitted with a coaxially located rotor hub disposed within the rotor means.

Ganin *et al.* disclosed a shrink fit means (interference fit) for connecting a bearing assembly (20) to a rotor body assembly (18). Ganin *et al.* taught that shrink fit is particularly advantageous for eliminating unbalance in the main joints of the anode assembly.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to connect the axial projection to the rotor hub using shrink fit means, since a person would be motivated to extend the service life of an x-ray tube by using an anode assembly that will maintain its balance at a high rotational speed.

With regard to claim 17, Eggelsmann in combination with Ganin *et al.* disclosed the anode assembly of claim 16, wherein at room temperature the rotor hub has an aperture (defined by 7 and 9) configured to receive the axial projection, the aperture is cylindrical having a diameter smaller than an outside diameter of the axial projection (inherent for interference fit).

With regard to claim 21, Eggelsmann disclosed an x-ray tube comprising: an envelope (1); a cathode assembly (2); an anode assembly including: a rotor body assembly

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including a rotor (8) and a stator (column 3, lines 56-59); a target (3), operatively connected to a thin-walled tubular thermal barrier (4) to form a target/bearing assembly; a target/bearing assembly to the rotor body assembly connection structure (4, 7, 9, 10) for operatively connecting the target/bearing assembly and the rotor body assembly.

However, Eggelsmann failed to teach that the target/bearing assembly to the rotor body assembly connection structure further comprises shrink fit means for connecting the target/bearing assembly and the rotor body assembly.

Ganin *et al.* disclosed a shrink fit means (interference fit) for connecting a bearing assembly (20) to a rotor body assembly (18). Ganin *et al.* taught that shrink fit is particularly advantageous for eliminating unbalance in the main joints of the anode assembly.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to connect the target/bearing assembly to the rotor body assembly using shrink fit means, since a person would be motivated to extend the service life of an x-ray tube by using an anode assembly that will maintain its balance at a high rotational speed.

23. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Eggelsmann (U. S. Patent No. 4,115,718) and Ganin *et al.* (U. S. Patent No. 5,838,762) as applied to claim 16 above, and further in view of Caraher *et al.* (U. S. Patent No. 4,866,748).

With regard to claim 19, Eggelsmann in combination with Ganin *et al.* disclosed the anode assembly of claim 16.

However, Eggelsmann and Ganin *et al.* failed to teach that the rotor hub is comprised of a metal selected to cause a composite coefficient of thermal expansion of the rotor match that of the axial projection.

Caraher *et al.* taught matching the coefficients of thermal expansion between the rotor (54) and the shaft (56) (column 8, lines 18-23).

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to match coefficients of thermal expansion between the rotor and the axial projection when they are joined by interference fit, since a person would be motivated to minimize mechanical stress between the rotor and the axial projection when operating at high temperature, which would lead to early failure of the x-ray tube.

Allowable Subject Matter

24. Claims 7, 11, 12, 18, 22, and 23 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

25. The following is a statement of reasons for the indication of allowable subject matter:

With regard to claim 7, although the prior art discloses the anode assembly of claim 5, it fails to teach or fairly suggest that a thin-walled tubular stem operatively supports the shaft between two center loaded bearings, each bearing disposed at opposite ends of the tubular stem, as claimed in claim 7.

With regard to claims 11 and 12, although the prior art discloses the x-ray system of claim 10, it fails to teach or fairly suggest that a shaft is supported by opposing bearings mounted with a thin-walled tubular stem, as claimed in claim 11.

With regard to claim 18, although the prior art discloses the anode assembly of claim 16, it fails to teach or fairly suggest that the aperture of the rotor hub is defined by an entry chamfer

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extending to a first inner cylinder wall that further extends to a second inner cylinder wall, wherein the first cylinder wall has a diameter smaller than the second inner cylinder wall, as claimed in claim 18.

With regard to claims 22 and 23, although the prior art discloses the x-ray tube of claim 21, it fails to teach or fairly suggest the connection structure further comprises a shaft supported by opposing bearings mounted with a thin-walled tubular stem, as claimed in claim 21.

26. Claims 1-4, 14, and 15 are allowed.

27. The following is an examiner's statement of reasons for allowance:

With regard to 1-4, although the prior art discloses a method for assembling a rotating x-ray tube, the x-ray tube having a cathode for emitting electrons, a rotor, and a bearing assembly for facilitating rotation of an anode, the method comprising: using interference fit assembly between the bearing assembly between the bearing assembly and the rotor to provide a joint having balance retention; wherein the using interference fit assembly further includes: selecting a shaft of the bearing assembly; selecting a rotor hub of the rotor; configure the shaft and an aperture in the rotor hub to interference fit tolerances; and joining the shaft to the rotor hub providing the joint having balance retention, it fails to teach or fairly suggest selecting a rotor hub of the rotor having a coefficient of thermal expansion which matches a higher coefficient of thermal expansion of the rotor to a lower coefficient of thermal expansion of the shaft, as claimed in claim 1.

With regard to claims 14 and 15, although the prior art discloses an anode assembly for an x-ray tube comprising a rotor assembly, a target connected to a thin-walled tubular thermal barrier to form a target/bearing assembly, and a target/bearing assembly to the rotor body

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assembly connecting structure, and a rotor hub having an aperture configured to receive a shaft and form an interference/shrink fit engagement, it failed to teach or fairly suggest that the shaft is supported by opposing bearings mounted with a thin-walled tubular stem, as claimed in claim 14.

Conclusion


28. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- (1) Wandke *et al.* (U. S. Patent No. 6,445,770 B1) disclosed a thermally isolated x-ray tube bearing.
- (2) Wandke *et al.* (U. S. Patent No. 6,125,169) disclosed a target integral heat shield for x-ray tubes.
- (3) Miller *et al.* (U. S. Patent No. 6,002,745) disclosed an x-ray tube target assembly with integral heat shields.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allen C. Ho whose telephone number is (703) 308-6189. The examiner can normally be reached on Monday - Friday from 8:00 am - 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward J. Glick can be reached at (703) 308-4858. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0530.



Allen C. Ho
Patent Examiner
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ACH